Sborník vědeckých prací Vysoké školy báňské – Technické univerzity Ostrava
číslo 1, rok 2008, ročník LI, řada hutnická
článek č. 1416

THE STRUCTURE AND PROPERTIES FIBROUS MATERIALS FOR DRY-GOODS

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ABSTRACT :
The lecture is focused on preparation of fleeces with different composition Polyesters and Polylactides fibres and on valuation textures and physical – mechanical properties these of these fleeces, that are serve as filler in quilts.
The aim of over time the work to have been prepare of fleeces from fibres, that are biodegratable and biocompacted.
We observed dimensional stability of fleeces directly after made and in time dependencies. Too oneself evaluate deformation and thermal-insulation properties of fleeces. Through the image analysis oneself evaluate macro-morphological structure and determine oneself share fibre and air in fleece.
In conclusion we judged the relations between structure and properties of prepared fleeces.

Key words: fleeces, polylactides polymers, polyesters fibres, utilitarian properties, quilts

1. INTRODUCTION

The fibrous materials are create important part industry. One from area application fibrous materials are housing unit dry-goods. In this category range too pillows and quilts. Preparation these materials was she bottom on natural materials how feathers, cotton and wave.

Nowadays oneself in forefront how filling material get synthetic fibres with changing cross and longitudinal geometry. The most frequently oneself are use Polyesters fibres in form clip and of an aggregated fibrous formation.

Today oneself attention slant on bacterial polymeric systems, that are synthesized on base natural renewable and non-toxic products. The most research is production Poly-lactic acid. On production fibre from Poly-lactic acid oneself use agricultural products containing starch and cellulose (corn, potatoes, sugar-beet, sugar-cane, waste biomass) [3].

1.1 The Polyesters fibres properties

The Polyesters (PES) fibres are the most frequently usage synthetic fibre in textile industry, housing unit industry and for technical textiles.

The macrostructure forms decision for wide spectrum physical properties fibres. Intentional change near creation PES fibres oneself is able to macrostructure change, therefore oneself spectrum properties is able to widen. Geometrically modified PES fibres are bearer physical properties with quantitative high worths. They are above all transport, barier, relaxation and optical properties [1].

The change cross and longitudinal geometry PES fibres and their products are change physical-mechanical properties, that are express [2, 3]:

- hike measuring surface fibres till about 100 % against circular sectionhike voluminosity fibres
- changing transport properties energy (thermical and sound, thermal and sounding-board, gaseous and liquidy mediums)

1.2 Antimicrobial modification fibres

The synthetic fibres are in biggies vital statistics resistant to microbial attack. Improvement utility properties, effect reactive resins maybe create certain protection against microbial attack. Important chemical fibre near preparation housing unit dry-good (quilts) are PES fibres [2].

1.3 Microbial types fibres

Towards microbial types fibres range too fibres prepared from Lactic acid. The fibres made of Polylactic acid (PLA) are one of the most promising biodegratable fibres with natural and synthetic fibre properties. Polylactides are made of Lactic acid.

Lactic acid is a simple natural organic acid that can be found in the bodies of animals, plants and microbes. It can be easily disintegrated in the nature without any harm to the environment [3].

Tab. 1: Chemical structure of PLA [3]

polymer	basic unit	monomer
Poly –lactic acid	$(-O-\underset{\mid}{CH}-CO-)_n$ CH_3	$HO-\underset{\mid}{CH}-COOH$ CH_3

1.4 PLA production

PLA is produced from Lactic acid, which is produced through fermentation of cornstarch. Lactron is derived from natural renewable resources, not from fossil ones. It can be composted or land-filled after use. Will be decomposed into carbon dioxide and water through the action of micro-organisms in the ground. In the both photosynthesis of plants (Fig. 2) [3].

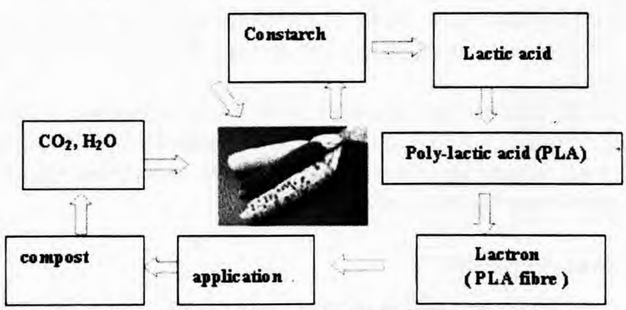


Fig. 2: Recycling of Lactron in nature [3]

1.5 PLA fibre properties

Primary applications have been identified in fibers, woven or knitted textiles and nonwoven fabrics where the properties of PLA form a natural bridge between those of the synthetic and natural fibres [4].

Tab. 2: Key properties PET and PLA

	PET	PLA
moisture management	contact angle = 0,135 moisture regain 0,2 – 0,4%	contact angle = 0,254 moisture regain 0,4 – 0,6%
resilience	51% recovery at 10% strain	64% recovery at 10% strain
renewable resource base	petroleum based	dextrose based (corn)
drape	poor	good
luster	medium to low	very high to low
density	1,34 g/cm^3	1,25 g/cm^3

2. EXPERIMENTAL PART

The aim experimental part of over time work to have been prepare fleece from mixture PES and PLA fibres, evaluate changes physical-mechanical and thermal-insulation properties quilts materials in dependence from sort applications composition.

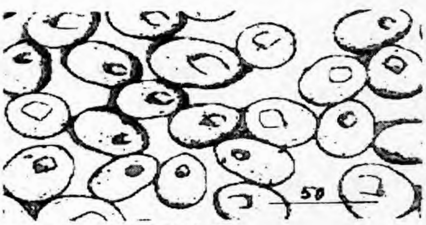
The use fibre :

- PES fibre – hollow conjugate fibre, length 64 mm (figure 3a, 4a)
- PLA fibre (figure 3b, 4b)

The use samples :

Of fleeces area weighted 200 g.m^{-2} were produce from these fibres:

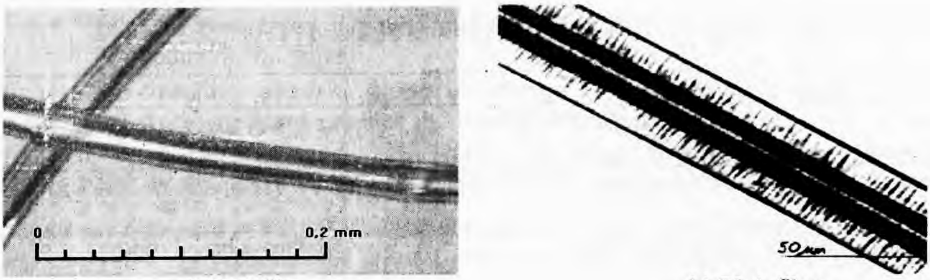
sample A – 100 % PES fiber
sample B – 80 % PES and 20 % PLA fibres
sample C – 60 % PES and 40 % PLA fibres
sample D – 40 % PES and 60 % PLA fibers
sample E – 20 % PES and 80 % PLA fibers
sample F – 100 % PLA fibre



a) PES fibre

b) PLA fibre

Fig. 3: Microscopic photographs cross-section single-impression fibres use on preparation fleece near 400 – multiple maximizable



a) PES fibre b) PLA fibre

Fig. 4: Microscopic photographs longitudinal geometry single-impression fibres use on preparation fleece near 740 – multiple maximizable

2.1 The results evaluation physical-mechanical properties PES and PLA fibres

The physical-mechanical properties oneself evaluated on symplex fibres, from which were prepared of fleeces (tab. 3).

Tab. 3: Attributes physical-mechanical properties PES and PLA fibfos

Parameter	Unit	Polyester fibre (single-impression)	Polylactide fibre (single –impression)
Length weigh	[dtex]	8,8	7,40
Average fortress	[cN]	24,1	14,69
Relative fortress	[cN/dtex]	2,7	1,98
Average tensibility	[%]	53,7	59,68
Youngov module	[cN/dtex]	5,3	27,30
Moisture content	[weigh. %]	0,9	0,36

2.2 The results evaluation dimensional stability of fleeces

We are followed dimensional stability directly after made and their in time dependencies. From the measurement values dimensional stability result that the biggest change has sample B (80 % PES and 20 % PLA). The best dimensional stability express sample F (100 % PLA).

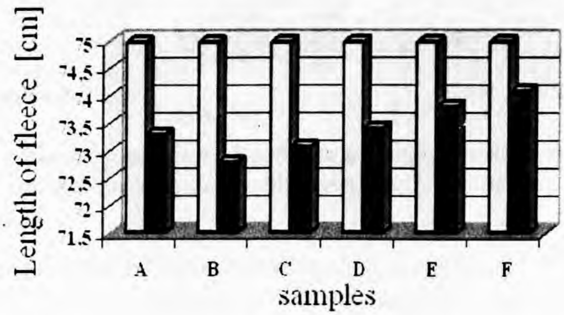


Fig. 5: The graph dependencies length of fleece over time after 5.minutes and 40.days

2.3 The results evaluation deformability of fleeces

Upon the measurement values deformability of fleeces result that the best recover properties has sample A from 100 % PES fibre. The worst recover properties oneself found at samples E (20 % PES and 80 % PLA) and F (100 % PLA).

2.4 The results evaluation physical-mechanical properties PES and PLA fibres

The physical-mechanical properties oneself evaluated on symplex fibres, from which were prepared of fleeces (tab. 3).

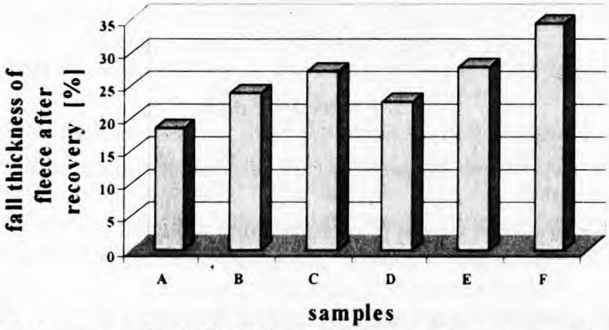


Fig. 6: The graph dependencies fall thickness of fleece after recovery from sort sample

2.4 The results evaluation thermal-insulation properties of fleeces

Mentioned camera complete series scanning thermograms camera make possible for every examination sample assign difference average temperatures above surface free parties sample against temperature environment. Whereby smaller is this temperature difference, reached in equal laboratory condition and equal time, so much the better are thermal – insulation properties samples of fleece (fig. 7).

Fig.7: The graphic dependence change surface temperature from samples of fleeces

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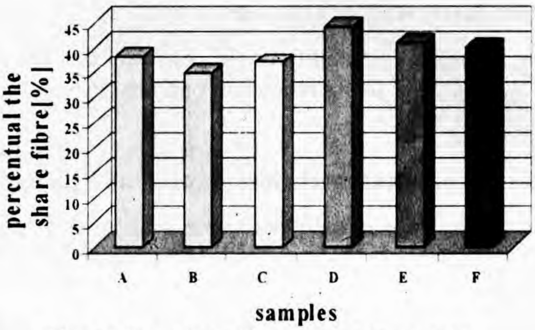

Fig. 8: The share fibre in single samples

3. CONCLUSION

The aim work to have been prepared of fleeces from fibres that are biodegradable and biocompacted.

Following receives knowledge maybe pronounce these thought:

Upon the results of physical-mechanical properties evaluation, we can presume that length weight, average fortress, relative fortress and moisture content PLA fibre are low in comparison with PES fibre. The average tensibility and Youngov module are higher at PLA fibre in comparison with PES fibre.

Upon the results dimensional stability in time dependencies, we can presume, that with remaining share PLA fibre oneself raise dimensional stability of fleece.

The results recover properties of fleeces prove, that sample from 100 % PES fibre contain less fibres how sample from 100 % PLA fibre.

Upon the results thermal – insulation properties is possible come to the conclusion, that partly superior thermal-insulation properties oneself express of fleece from PLA fibre as consequence molecular structure – macrostructure – hollow and plastic fibre, partly worse thermal-insulation properties oneself express of fleece from PES fibre.

The results image analysis allocate at it, thereby that fibre from PLA were soft oneself use more fibre for create asking weighted of fleece.

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